COLORADO RIVER RECOVERY PROGRAM Project No.: CAP-6 larval entrainment
FY-2001 PROPOSED SCOPE OF WORK

Evaluation of larval razorback sucker drift into flood plain wetlands.

Lead Agency: Utah Division of Wildlife

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Category:
_Ongoing project
_Ongoing-revised project
_Requested new project
xUnsolicited proposal

Expected Funding Source:
_Annual funds
xCapital funds
_Other (explain)

I. Title of Proposal:

Evaluation of larval razorback sucker drift into flood plain wetlands following reconfiguration of levee breeches.

II. Relationship to RIPRAP:

Green River Action Plan:Mainstem
II.A.3. Implement levee removal strategy at high priority sites.
II.A.3.c. Evaluation

III. Study Background/Rationale and Hypothesis:

Flood plain wetlands are presumed to be important rearing habitat for the endangered razorback sucker (Wydoski and Wick 1998; Muth et al. 1998; Lentsch et al. 1996). Reproduction by razorback suckers occurs in the spring during peak flows of the hydrograph when highly productive flood plain habitats are accessible (Muth et al. 1998). This seasonal timing of razorback sucker reproduction indicates possible adaptation for utilizing flood plain habitats (Muth et al. 1998).

Based on the assumption that flood plain wetlands provide critical rearing habitat for razorback suckers, the Recovery Program initiated an extensive flood plain habitat restoration program (Levee Removal). The goal of the Levee Removal Program was to

restore natural flood plain wetland habitats and functions that support recovery of endangered fish (specifically the razorback sucker) (Lentsch et al. 1996). To accomplish this goal, levees at selected wetlands were lowered to increase the frequency of the riverine-flood plain connection to pre Flaming Gorge Dam levels. In nearly all cases a single breach was cut at the downstream end of selected sites (except Leota/L7). This breach configuration was based on the assumptions that: 1) Rates of sediment deposition would be lowest with a downstream breach, resulting in less need for annual excavation to maintain connections between the site and the river; and 2) Downstream breaches would be less risky in terms of affecting site morphology and main channel stability, and would be less likely than an upstream breach to reroute the main channel or convert the wetland into a secondary channel. However, the primary problem with downstream configuration of levee breaches is transport of drifting larvae to the flood plain is not maximized. This is significant because flood plain wetlands are occupied by high densities of non native fish and other potential predators. Optimization of larval entrainment in the flood plain may be crucial for ensuring some survival of entrained larval razorback suckers. Sites with single downstream breaches do not optimize larval entrainment because fish can only be entrained on days of increasing flow. As river flows rise above flooding levels (13,000 cfs for most breaches) the wetlands begin to backfill. Filling time (usually several days to a week) for each site is dependent on main channel flows, the size of the site and the configuration of the connection with the river. When sites are full or at the point of equilibrium (water elevation within the site matches water elevation in the river) water ceases flowing into the site. Throughout the remaining high flow period as river flows fluctuate water surges in and out of the flood plain sites. During these periods of equilibrium and receding flows, flood plain sites with single downstream breaches are incapable of entraining passive drifting razorback sucker larvae. Entrainment in the flood plain is limited to days river flows increase resulting in a “filling surge” (Birchell et al. 1998).

An experimental effort to improve connection will be conducted in the spring of 2000 when breaches will be cut on the upstream ends of two Levee Removal sites with downstream breaches (Above Brennan and Bonanza Bridge). Breaches configured in this manner should maximize larval razorback entrainment because water flowing into the site is not dependent on “filling surges”. Instead water will flow into these sites constantly during the period river flows exceed the flood ability level of the upstream breaches. Evaluating the effectiveness of these new levee breach configurations will provide answers to several important questions pertaining to the flood plain restoration program. These are: 1) Can we entrain larval razorback suckers in the flood plain by lowering levees to improve the riverine-flood plain connection? 2) Can they be entrained at high enough numbers to ensure some survival from predation by nonnative fish and piscivorus insects? And how should future levee breaches be configured? To evaluate the entrainment effectiveness of the new upstream breaches the strategy is to monitor the passage of drifting larvae into the sites and estimate the number of larvae entrained. Then assuming some larvae are entrained determine if any survive within the sites.

IV. Study Goals, Objectives, End Product:

Study Goal

To determine larval fish entrainment effectiveness of upstream breach configuration.

Study Objectives

1) Monitor passage of drifting native sucker larvae into flood plain sites through new upstream connections, and estimate the number of larvae entrained in each site.

2) Evaluate if upstream breach connections are more effective entraining larval razorback suckers than downstream breaches.

End Product

Report evaluating success of larval fish entrainment through upstream breaches and recommendations for future levee breach configuration that may help optimize larval razorback sucker entrainment in the flood plain.

V. Study Area:

Bonanza Bridge (RM 290.0) and Above Brennan (RM 268.5) Levee Removal sites.

VI. Study Methods/Approach

Objective 1. Monitor passage of drifting native sucker larvae into flood plain sites.

Drift nets will be set in the upstream breaches to monitor passage of drifting native larval suckers into the flood plain sites. The outflow of each site will also be sampled with drift nets to determine if larval fish are drifting through the site. Because numbers of drifting larval razorback suckers are likely to be low larval flannelmouth and bluehead suckers will serve as surrogate drifting larvae. Larvae for both of these species are known to drift in the river simultaneously with razorback sucker larvae. Muth et al. (1998) captured 30,558 native catostomids during spring sampling for razorback sucker larvae in the middle Green River from 1992 - 96. Of this number 46% were flannelmouth suckers, 46% bluehead suckers, 6% razorback suckers and 2% unidentified. Levee Removal sampling efforts also resulted in the capture of these three species during riverine-flood plain connection period (Modde et al. 1998). Sampling will begin 2 weeks following initial flood plain-riverine connection (usually first part of May) and continue until upstream breaches disconnect. During previous studies earliest captures of razorback sucker larvae occurred in mid to late May (Modde et al. 1998 and Muth et al. 1998). Delaying sampling by 2 weeks will allow greater effort to be spent during more productive drift periods. Sampling intensity will be lower during initial efforts. One or two drift nets will be set at each site during 8 hour day or night work shifts. Nets will be

checked in 1 to 4 hour increments depending on the amount of debris captured. During peak drift periods (i.e., when large quantities of native larval suckers are encountered in sets) nets will be set around the clock and checked at the same time increments. Water volume passing through each drift net set will be calculated using mechanical flow meters (manufactured by General Oceanics). Flow volume in the upstream breaches will also be calculated several times during each sampling day. Flow volume in downstream breaches will not be calculated. During 8 hour shifts flow will be calculated when crews first arrive at the site, half way through the shift and again just before they leave. During 24 hour monitoring flow will be calculated at the beginning of each 8 hour crew change. An estimate for the total number of larvae entrained each day will be calculated by extrapolating the number of larvae caught per unit of volume in the drift nets to the total volume of water flowing into the site. The total contents of each drift net set will be preserved in alcohol. Drift net samples will be searched by UDWR personnel for native larval suckers.

Objective 2. Evaluate if upstream breach connections are more effective entraining larval razorback suckers than downstream breaches.

Data collected during this study will be compared with data already collected during previous Levee Removal sampling to determine if upstream breaches entrain larval fish more effectively. Flow data (cfs and direction of flow) was collected at the Above Brennan site in 1999. The actual number of days water is flowing into each site when connected with only downstream breaches will be compared to the number of days water is flowing into the site with upstream breaches. Drift net data from Levee Removal will also be compared for increases in CPU.

VII. Task Description and Schedule

Task 1: Field Data Collection
- Larval Fish Data collection
  - Larval drift period 2001
- Flow data collection
  - Larval drift period 2001

Task 2: Drift Net Sample Processing
- Drift net picking and fish identification (UDWR)
  - June - July

Task 3: Data Management
- Data entry

Task 4: Report Preparation
- Annual RIP Report (Dec 2001)
- Final Report (July 2002)

VIII. FY-2001 Work

-Deliverables/Due Dates
Annual RIP report 12/01
Final report (July 2002)

	UDWR
Task 1: Field Data Collection	
Labor-	14,000
Travel-	1,000
Equipment-	1,000
Task 2: Drift Net Sample Processing	
Labor-	6,000[a]
Other-	500
Task 3: Data Management	
Data Entry-	500
Task 4: Report Preparation	
Labor	5,000
Total	$ 28,000

[a] 1 seasonal 80 days 8 hr/day

IX. Budget Summary

FY-2001 $28,000

X. References

Birchell, G. J., K.D. Christopherson, and D. Ward. 1998. Physical description of sampling sites. Chapter 2 *in* Green River levee removal and flood plain connectivity evaluation preliminary synthesis report. Utah Division of Wildlife Resources, Salt Lake City, Utah 201 pp.

Lentsch, L., T. Crowl, P. Nelson, and T. Modde. 1996. Levee removal strategic plan. Utah Division of Wildlife Resources, Salt Lake City, Utah. 21 pp.

Modde, T., M. Fuller, and G.J. Birchell. 1998. Native Fish. Chapter 6 in Green River levee removal and flood plain connectivity evaluation preliminary synthesis report. Utah Division of Wildlife Resources, Salt Lake City, Utah 201 pp.

Muth, R.T., G.B. Haines, S.M. Meismer, E.J. Wick, T.E. Chart, D.E. Snyder and J.M. Bundy. 1998. Reproduction and early life history of razorback sucker in the Green River, Utah and Colorado, 1992 - 1996. Final Report submitted to the

Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver, CO. 62 pp.

Wydoski, R.S. and E.J. Wick. 1998. Ecological value of floodplain habitats to razorback suckers in the Upper Colorado River Basin. Final Report submitted to the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver, CO. 55 pp.